

## Continuous River Channel Flow

Expectation: Continuous flows in restored portions of the Kissimmee River channel.

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Relevant Endpoints: Restoration - Physical Integrity - Hydrology  
Restoration - System Functional Integrity - Habitat Quality  
Restoration - System Functional Integrity - Persistence

Baseline Condition: Baseline conditions were derived from daily discharge records at S65 from 1971 to 1998 and a permanent flow monitoring site (PC33) on Micco Bluff Run in Pool C. S65 is located at the outlet of the Upper Kissimmee Basin. Data collected from November 1997 to May 1999 at PC33 are representative of existing flow conditions in sections of the river channel that will be affected by the first Phase of restoration.

From 1971 - 98, zero inflows occurred through S65 an average of 182 days per year (range = 11 to 307 days per year). The seasonal distribution of zero flow days (Table 1) reflects the existing flood control operational schedule at S65. Frequencies of zero flow conditions are lowest during April and May when discharges are made to lower lake stages. The headwater lakes are drawn down to their seasonal low between February and June 1 in preparation for wet season rainfall. No flow periods are most common during June-December when lakes are allowed to fill to their maximum flood control elevation.

Data from PC33 indicate that zero flows occurred through the remnant river channel approximately 70% of the time from November 1997 to May 1999. Instantaneous discharges measured in other remnant river channels verified that these flow conditions occurred in all remnant river channels in Pool C. A one-day maximum mean daily discharge of 33 cms (1170 cfs) was recorded at PC33 on March 21, 1998 during extreme weather conditions caused by El Nino weather patterns. During this event, discharges exceeded 2.8 cms (100 cfs) for seven days.

Table 1. Mean monthly number of days that zero flow occurred at S65 during 1971 to 1998.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average # of Zero flow days	8	4	5	2	2	13	14	10	9	14	15	12

Reference Condition: Historical daily discharge data at three locations along the Kissimmee River from 1933 to 1960 show continuous flows, with low flows occurring during April and May (Toth et al 1995; 1997). Headwater inflows contributed approximately 60% of the flows through the Kissimmee River, while tributary contributions represented about 40% of historical discharges.

However, during October 1956, there were six days of reverse flow into Lake Kissimmee (present location of S65) following an intensive rainstorm that dropped 16 inches of rain in two days. Severe drought conditions existed prior to the storm and the water level had dropped below ground levels in the floodplain downstream of the lake. In addition,

downstream landowners had constructed levees along the river to dike their land, which reduced the floodplain width to 400 feet in some areas. The heavy rainfall and constricted floodplain caused reverse flow from the river to Lake Kissimmee.

Mechanism for

Achieving Expectation:

Implementation of the new regulation schedule for the restoration project will provide continuous flow through S65 to the restored Kissimmee River channel.

Restoration of the physical form of the river, through backfilling C38 and carving new river segments, will force flows through the Kissimmee River.

Adjustment for

External Constraints:

The expectation of continuous flow does not account for flood control and navigation constraints on the new regulation schedule and operation rules for the upper basin. Modeling conducted to develop this regulation schedule indicates that zero flow could occur occasionally during January through August. However, during the simulation period (1970-1987), the basin received approximately 10% less rainfall than during the pre-channelization period (Obeysekera & Loftin, 1990). In addition, the model underestimated discharges by approximately 20%. The potential for more normal (average) rainfall conditions will decrease the likelihood of zero flow conditions.

Means of Evaluation:

Daily discharge data at S65 and PC33 will be used to evaluate the occurrence of zero flow days in the river. Data from site PC33 will be the primary focus because it's located in a restored river reach. The ecological significance of short no-flow periods will be evaluated with related restoration studies (e.g. dissolved oxygen monitoring).

Time Course:

Continuous flows will be initiated following implementation of the new regulation schedule. Initial evaluation will begin one year after implementation of the new regulation schedule and continue annually for a minimum of five years.

## References

- Obeysekera, J. and M.K. Loftin. 1990. Hydrology of the Kissimmee River Basin- influence of man-made and natural changes. Pp. 211-222. In: Loftin, M.K., L.A. Toth, and J. Obeysekera. (eds.) Proc. Kissimmee River Restoration Symp., October 1988, Orlando, Florida. S. Fla. Water Manage. Dist. West Palm Beach, FL.
- Toth, L.A., D.A. Arrington, M.A. Brady, and D.A. Muszick. 1995. Conceptual evaluation of factors potentially affecting restoration of habitat structure within the channelized Kissimmee River ecosystem. *Restoration Ecology* 3:160-180.
- Toth, L.A., D.A. Arrington, and G. Begue. 1997. Headwater restoration and reestablishment of natural flow regimes: Kissimmee River of Florida. pp. 425-442 in: Williams, J.E., C.A. Wood, and M.P. Dombeck. (eds.) *Watershed restoration: principles and practices*. American Fisheries Society, Bethesda, Maryland.